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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/591,584

11/27/2006

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Q80400

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23373 7590 12/14/2007
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EXAMINER

WILSON, SCOTT R

ART UNIT

PAPER NUMBER

2826

MAIL DATE

DELIVERY MODE

12/14/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/591,584	Applicant(s) KOBAYAKAWA ET AL.	
	Examiner Scott R. Wilson	Art Unit 2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 May 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05 September 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>9/5/06, 5/24/07</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-6 are rejected under 35 U.S.C. 102(b) as being anticipated by Yagi et al. (US 6,297,442). As to claim 1, Yagi et al., Figure 5, discloses a gallium nitride-based semiconductor device having a p-type layer that is a gallium nitride (GaN) compound semiconductor layer (21) containing a p-type impurity and exhibiting p-type conduction, wherein the p-type layer comprises a top portion (21-a) (col. 6, lines 60-61) and an inner portion (21-b) located under the top portion, wherein the inner portion contains the p-type impurity and, in combination therewith, hydrogen (col. 14, lines 6-8) and wherein the top portion includes a region containing a Group III element and a Group V element at a non-stoichiometric atomic ratio (col. 4, lines 11-13).

As to claim 2, Yagi et al. discloses (col. 5, lines 31-36) that the inner portion of the p-type layer has a percent thickness of 40% to 99.9% with respect to a thickness of the p-type layer.

As to claim 3, Yagi et al. does not expressly ^{teach} ~~teach~~ the hydrogen or p-type concentration, however, a concentration of order 10^{18} cm^{-3} to 10^{21} cm^{-3} is well-understood in the art. See, for example, DiLorenzo (US 3,762,945), Abstract.

As to claim 4, Yagi et al. discloses (col. 4, lines 20-22) that the inner portion has a hydrogen concentration that is equal to, or lower than, an impurity concentration.

As to claim 5, Yagi et al. discloses (col. 5, line 33) that the region containing a Group III element and a Group V element at a non-stoichiometric atomic ratio has a thickness as small as 10 nm from the top surface of the p-type layer in a depth direction.

As to claim 6, Yagi et al. discloses (col. 7, lines 13-16) that the top portion of the p-type layer has a surface having Ga deposited thereon.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yagi et al. in view of Udagawa (JP 2004-14810 A). As to claim 7, Yagi et al., Figure 1, discloses the structure of claim 1, as described above. Yagi et al. does not disclose expressly that the p-type layer has a surface having joined thereto a gallium nitride semiconductor material containing a Group-III element and a Group V element at a non-stoichiometric atomic ratio. Udagawa, Figure 2, discloses a III-V layer joined to a GaN semiconductor structure, embodied as an amorphous boron phosphide (BP) layer. At the time of invention, it would have been obvious to a person of ordinary skill in the art to form the layer of Udagawa on the device of Yagi et al.. The motivation for doing so would have been to reduce the resistance of the upper barrier layer (Udagawa, Problem to Be Solved). Therefore, it would have been obvious to combine Udagawa with Yagi et al. to obtain the invention as specified in claim 7.

As to claim 8, Udagawa discloses (Solution) that the material is boron phosphide (BP) which is amorphous, and may therefore have a non-stoichiometric atomic ratio.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Scott R. Wilson whose telephone number is 571-272-1925. The examiner can normally be reached on M-F 8:30 - 4:30 Eastern.

Application/Control Number:
10/591,584
Art Unit: 2826

Page 4

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sue Purvis can be reached on 571-272-1236. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

srw
December 10, 2007

/ A. Sefer /
Primary Examiner
AU 2826